2387

PROJECT SPECIFIC PLAN FOR SAMPLING OF THE ADVANCED WASTEWATER TREATMENT FACILITY SOIL STOCKPILE FOR OSDF WAC ATTAINMENT

SOIL AND DISPOSAL FACILITY PROJECT

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO

JULY 1999

U.S. DEPARTMENT OF ENERGY
FERNALD AREA OFFICE

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REVISION B
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20500-PSP-0002
Revision B
Draft

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APPROVAL:

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Soil and Disposal Facility Project

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FERNALD ENVIRONMENTAL MONITORING PROJECT

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LIST OF ACRONYMS AND ABBREVIATIONS

ASL	analytical support level
AWWT	Advanced Wastewater Treatment (Facility)
ccpm	corrected counts per minute
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COCs	constituents of concern
DQO	Data Quality Objectives
GPS	Global Positioning System
HPGe	high-purity germanium
ICP/MS	Inductively Coupled Plasma/Mass Spectroscopy
mg/kg	milligram per kilogram
mL	milliliter
OSDF	On-Site Disposal Facility
ppm	parts per million
PSP	Project Specific Plan
QA	Quality Assurance
RCRA	Resource Conservation and Recovery Act
RMS	Radiation Measurement System
RSS	Radiation Scanning System
RTIMP	Real-Time Instrumentation Program
RTRAK	Real-Time Tracking System
SCQ	Sitewide CERCLA Quality Assurance Project Plan
SED	Sitewide Environmental Database
SEP	Sitewide Excavation Plan
SVOC	semi-volatile organic compound
TAL	Target Analyte List
V/FCN	Variance/Field Change Notice
WAC	waste acceptance criteria
WAO	Waste Acceptance Organization

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1.0 INTRODUCTION

1.1 PURPOSE

This project specific plan (PSP) has been developed to provide data to demonstrate waste acceptance criteria (WAC) attainment for the Advanced Wastewater Treatment (AWWT) Facility stockpile, as required by the Sitewide Excavation Plan (SEP) and the WAC Attainment Plan for the On-Site Disposal Facility (OSDF). The stockpile location is shown on Figure 1-1. The sampling strategy presented in this PSP includes random and biased soil sampling throughout the stockpile and real-time gamma spectrometry measurements over the stockpile surface.

The AWWT stockpile should be excavated between October and December 1999. WAC attainment characterization is necessary prior to excavation to evaluate data and, if needed, to develop the excavation monitoring PSP for the stockpile.

This PSP fulfills the SEP and the WAC Attainment Plan requirements for developing predesign investigation plans and justifying selection of stockpile-specific WAC constituents of concern (COCs). The data generated under this PSP will be used to: 1) demonstrate that soil meeting the OSDF WAC may be bulk excavated and placed in the OSDF, 2) identify areas of soil which may exceed the OSDF WAC, and 3) apply an excavation monitoring approach to the stockpile.

1.2 AWWT STOCKPILE HISTORY

The AWWT stockpile [Material Tracking Location AWT-001] is located in the southern portion of the Former Production Area, south of the AWWT Building and concrete pad within Soil Remediation Area 7 (see Figure 1-1). The stockpile consists of approximately 2,900 cubic yards of soil and soil-like material. The stockpile was created in 1993 by consolidating soil generated during the AWWT concrete pad construction. Approximately 2,860 cubic yards of soil was generated during this construction. Written descriptions of historical photos of the area indicate no evidence of waste material evident within the area, but debris was visible nearby. A separate excavation plan will address the OSDF WAC requirements for placement of debris. Approximately 36 cubic yards of mixed soil and gravel in the stockpile came from a trench that was constructed in 1996 near the Slurry Dewatering Building (Building 51b). The entire stockpile is surrounded by a construction fence. The material

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contained in the stockpile from the concrete pad construction and the nearby trench originated in Remediation Area 7.

1.3 DETERMINATION OF AWWT WAC COCs

1.3.1 Existing Data

The existing AWWT stockpile soil data were collected in 1988, 1992, and 1993 during construction of the AWWT concrete pad. Four samples (three collected in 1988 and one in 1993) were analyzed for radionuclides, total metals, volatile organic compounds, semi-volatile organic compounds (SVOCs), pesticides, and herbicides. The four samples were collected at the corners of the concrete pad construction area. All results were below OSDF WAC limits (see Appendix A). Additional data were collected in 1992 in the concrete pad construction area. Eighteen samples were analyzed for total uranium and alpha/beta activity. Total uranium results were all below OSDF WAC limits (see Appendix A).

1.3.2 COCs

Existing data collected from Remediation Area 7 during the Remedial Investigations/Feasibility Studies demonstrate that only two of the 18 WAC COCs were detected at above-WAC concentrations or have above-WAC analytical detection limits:

- total uranium
- technetium-99

All of the detections of the other 16 WAC constituents are significantly below the WAC limit. However, two of the constituents [4-nitroaniline and bis(2-chloroisopropyl)ether] have analytical detection limits above the actual WAC limit making a WAC determination for these two SVOCs impractical. These two SVOCs were analyzed in Removal Action 17 of Stockpiles 1, 2, and 4 and were not found to be present. They were also analyzed in Stockpile 5 and again were not found to be present. Based on the known levels of these constituents and the probable land use of the area during the production period, 4-nitroaniline and bis(2-chloroisopropyl)ether are assumed to have below-WAC concentrations. Therefore, only total uranium and technetium-99 were retained for investigation.

Since the material comprising this stockpile was not located near any potential Resource Conservation and Recovery Act (RCRA) characteristic areas, no toxicity characteristic leaching procedure analyses will be performed.

1.4 SCOPE

Under this PSP, real-time and soil sampling will be conducted to identify soil contamination above the OSDF WAC for total uranium and technetium-99. If above-WAC contamination is found, additional biased samples may be collected to adequately bound the above-WAC material. These additional sample locations and intervals will be identified in a variance to this PSP. Sampling activities carried out under this PSP will be performed in accordance with the Sitewide Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Quality Assurance Project Plan (SCQ), the SEP, the WAC Attainment Plan for the OSDF, and Data Quality Objectives (DQO) SL-048, Rev. 5 (Appendix B).

Design of the excavation for the AWWT stockpile is not included in the scope of this PSP.

1.5 KEY PROJECT PERSONNEL

The team members responsible for coordination of work in accordance with this PSP are listed in Table 1-1.

TABLE 1-1
KEY PERSONNEL

Title	Primary	Alternate
DOE Contact	Rob Janke	Kathi Nickel
Project Manager	Tom Crawford	Jyh-Dong Chiou
AWWT Stockpile Characterization Lead	Deanna Diallo	Christine Messerly
Real-Time Instrumentation Program (RTIMP) Manager	Joan White	Dale Seiller
RTIMP Field Lead	Roger Knight	Dave Allen
Field Sampling Lead	Mike Frank	Tom Buhrlage
Surveying Lead	Jim Schwing	Jim Capannari
Waste Acceptance Operations (WAO) Stockpile Contact	Linda Barlow	Dale Weber
FEMP Sample Management Office Contact	Audrey Hannum	Denise Arico
Data Management Lead	Deanna Diallo	Mike Rolfes
Data Validation Contact	Jenine Rogers	Jim Cross
Quality Assurance Contact	Frank Thompson	Reinhard Friske
Health and Safety Contact	Debbie Grant	Lewis Wiedeman

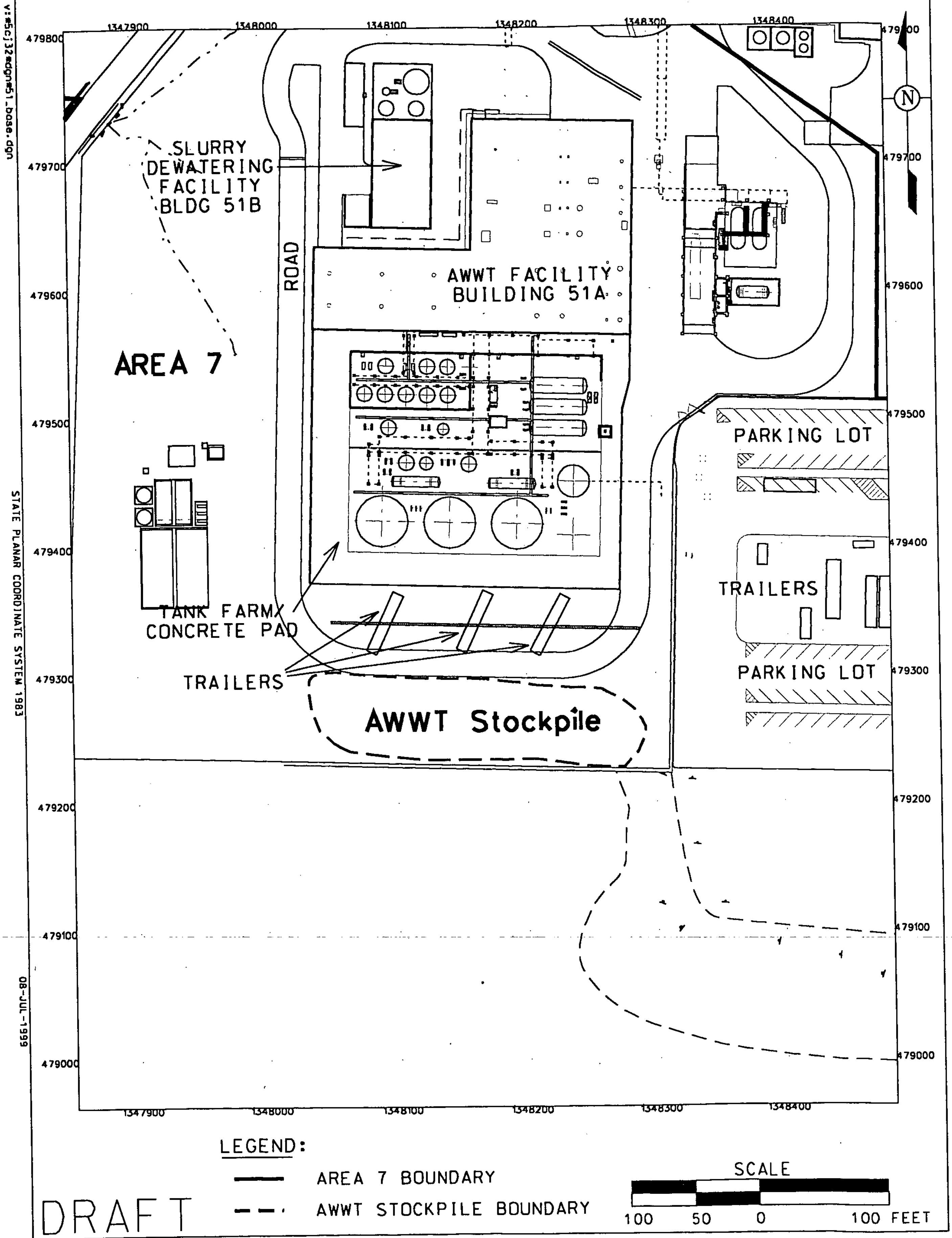


FIGURE 1-1. AWWT STOCKPILE LOCATION

2.0 SAMPLING STRATEGY

2.1 DETERMINATION OF NUMBER OF SAMPLES

In accordance with the SEP and OSDF WAC Attainment Plan, the number of samples determined to adequately characterize the AWWT stockpile is collectively based on the current data set, process knowledge of the stockpiles, and sampling density in previous soil stockpile sampling projects. Based on these guidelines, ten sample locations have been randomly generated and one sample per location will be collected from the stockpile (see Figure 2-1).

An analytical frequency has been established for the WAC COCs based on the stockpile volume and biased core frisking. The density of the random samples that will be collected from the AWWT stockpile translates to an average of approximately one sample per 290 cubic yards, [a higher density than that performed for the Area 1, Phase I West Impacted Soil Stockpile (one sample per 420 cubic yards) and Soil Stockpile 5 (one sample per 350 cubic yards)]. Any biased samples that are collected as a result of beta/gamma scanning (see Section 2.3.3) or HPGe measurements (see Section 3.0) will increase this sampling density. All soil samples from the random location depth intervals will be analyzed for total uranium and technetium-99.

2.2 SELECTION OF SAMPLE LOCATIONS

Sample locations and depths are based on a combination of systematic grid/random approach and biased sampling at the random boring locations. At least ten samples will be collected through this integrated sampling strategy for the stockpile; additional samples may be collected, depending on field beta/gamma readings or real-time monitoring (see Section 2.3.3).

A systematic approach was used to establish a sample grid over the stockpile surface (see Figure 2-1). The grid pattern was based on surface area and consists of ten grid blocks of approximately equal size. A random sample location (northing and easting coordinate) and depth was selected within each block Alternate random depths were also selected in case of refusal. If the alternate random depth interval is taken in place of the primary depth interval, it will be documented with a Variance/Field Change Notice (V/FCN). The random sample depth intervals are presented in Appendix C. If a boring has to be relocated prior to sampling, the sample depth interval(s) will be recalculated based on the pile height at the new location. Sampling locations will be surveyed (northing, easting, and elevation) and the information will be documented with a V/FCN.

2.3 SAMPLE COLLECTION METHODS

Samples will be collected using the Geoprobe® Model 5400 in accordance with procedure EQT-06, *Geoprobe® Model 5400 - Operation and Maintenance*, where locations support the safe operation of the Geoprobe® vehicle. Hand augering or direct-push liner sampling will be conducted in accordance with procedure SMPL-01, *Solids Sampling*, when the Geoprobe® cannot be used. At each sampling location, the surface vegetation within a 6-inch radius of the sample point will be removed using a stainless steel trowel or by hand with clean nitrile gloves while taking care to minimize the removal of any soil.

Random soil samples will be collected from the 6-inch intervals identified in Appendix C. If additional volume is necessary, samples will be collected from the same approximate intervals adjacent (within a one foot radius) to the original sample location and recorded on the appropriate field documentation.

All borings will be completed 0.5 to 1.0 feet below the base of the pile for field screening purposes. If resistance is encountered during the soil borings, up to two additional borings within a one foot radius of the original point will be taken and composited to collect the specified volume. Additional boring locations will not be moved across grid lines. If the random sample location cannot be collected (Appendix C, Table C-1), the alternate random sample location will be selected from the secondary random sample list (Appendix C, Table C-2). All encounters with subsurface debris will be noted in the field log in order to characterize the pile for debris content. Borehole plugging following sample collection will not be necessary.

2.3.1 Geoprobe® Methods

If the Geoprobe® is used, a Geoprobe® Macro-Core sampler will be advanced in approximately 12 to 48-inch increments to collect the target depth intervals for the soil samples specified in Appendix C. Multiple cores may be collected at each sampling location (not to exceed 1 foot apart) to obtain sufficient sample volume for analysis if complete sample recovery is not obtained. Borehole collapse will be monitored during core sampling to ensure minor sidewall slough is accounted for during coring and sample collection. If significant borehole collapse occurs, a closed-tube, piston-type core sampler (Macro-Core) will be employed which is closed during advancement to the sample interval, then opened to collect the discrete interval of interest. The Macro-Core sampling method will utilize a disposable plastic liner insert in which the soil core is recovered.

2.3.2 Manual Sampling Methods

If Geoprobe® accessibility is not possible, soil samples will be collected using a hand auger (typically 3-inch diameter) or other methods in specified in SMPL-01, *Solids Sampling*. The hand auger will be advanced in approximately 6-inch increments down to 0.5 to 1.0 feet below the base of the stockpile for the soil samples specified in Appendix C. As with core sampling, multiple holes at one sampling location (not to exceed 1 foot apart) may have to be augered to obtain sufficient volume for laboratory analysis. The same hand auger may be used through the entire depth of a single boring. Borehole collapse will be monitored during core sampling to ensure sidewall slough is accounted for during augering and sample collection. The borehole will be manually collapsed following sample collection to eliminate the possibility of injury to workers. For additional surface samples collected as a result of real-time radiological scanning (see Section 3.0), a direct-push liner (6-inch length) may be used to collect the samples from the 0 to 0.5-foot interval.

2.3.3 Biased Sample Selection

All identified random sample locations will be collected, at a minimum. The soil from each boring will be radiologically screened using a beta/gamma (Geiger-Mueller) survey meter. The entire length of the soil core (or cuttings in the case of hand augering) will be surveyed to determine any intervals with beta/gamma readings above 400 corrected counts per minute (ccpm), as established in Appendix D of the Area 2, Phase I Integrated Remedial Design Package. These identified intervals will be sampled and analyzed for total uranium only [Appendix D, Target Analyte List (TAL) B]. If the entire soil core is found to be less than 400 ccpm, then no high-biased sample will be collected from that boring. Archive samples will be collected from the 6-inch intervals above and below any sample intervals that are above 400 ccpm. If the interval above or below is already designated for sampling, then no additional archive sample will be collected in that direction. In the event that biased sample intervals are above the total uranium WAC, the archive samples may be submitted for analysis in an attempt to vertically bound the contamination. All biased samples will be documented on a V/FCN.

2.3.4 Soil Sample Processing and Analysis

The Geoprobe® soil cores or hand-augered soil cuttings will be laid out on clean plastic and the appropriate sample intervals (as defined in Appendix C) will be separated to obtain the necessary samples following radiological field screening for beta/gamma levels. Any debris (e.g., wood, concrete, metal) contained in a sample interval will be removed from the sample in the field. Sampling and analytical requirements are summarized in Table 2-1. Radiological analyses (Appendix D, TALs A and B) will be performed on site.

2.4 SAMPLE IDENTIFICATION

All soil samples collected for laboratory analysis will be assigned a unique sample identifier, as listed in Appendix C. This identifier will consist of a prefix designating the area name (AWT-001), followed by the sample point number (1 through 10), followed by the interval number, followed by a letter designating the type of sample ("R" for radionuclides). For example:

> AWT-001-2-23-R is the sample collected at sample point 2 at depth interval 23 (11 to 11.5 feet) in the AWWT stockpile and is being analyzed for radionuclides.

Biased samples collected as a result of beta/gamma surveys will have a "B" followed by a sequential number 1 through x inserted after the sample point number. An "R" will designate total uranium analysis. For example:

> AWT-001-2-5-B1-R is the first biased sample collected at sample point 2 at depth interval 5 (2.0 to 2.5 feet) and is being analyzed for total uranium.

Any archive samples collected will be designated by a "V" suffix (e.g., AWT-001-2-6-R-V).

If a boring location requires multiple borings due to encountering debris below the surface, or if a boring is moved after attempting the original location, the boring grid identifier will be designated with an alphabetic suffix (e.g., 7A or 7B). A maximum of three attempts to collect the sample will be done at the original boring location. The boring location may be moved a maximum of two times, within a three feet radius, in order to collect the sample at the original boring location. Otherwise, the sample will be collected from the secondary random sample location generated in that grid area (Appendix C, Table C-2), and documented on a V/FCN. Therefore, a random sample collected during the second attempt at sample point 2 in the AWWT stockpile would be AWT-001-2B-23-R.

2.5 EQUIPMENT DECONTAMINATION

Sampling equipment will be decontaminated before transporting to the sampling site. Additionally, equipment will be decontaminated, including the core sampler cutting shoe, hand auger buckets, and other sample collection tools between boring locations. All decontamination will be Level II decontamination as specified in SMPL-01, *Solids Sampling*. If used, the core barrel portion of the core sampler will be wiped down between sample intervals and locations to remove visible soil or material. Decontamination of the core barrel will not be necessary because the core barrel will not come into contact with the sample when using a liner insert.

2.6 SAMPLE HANDLING AND SHIPPING

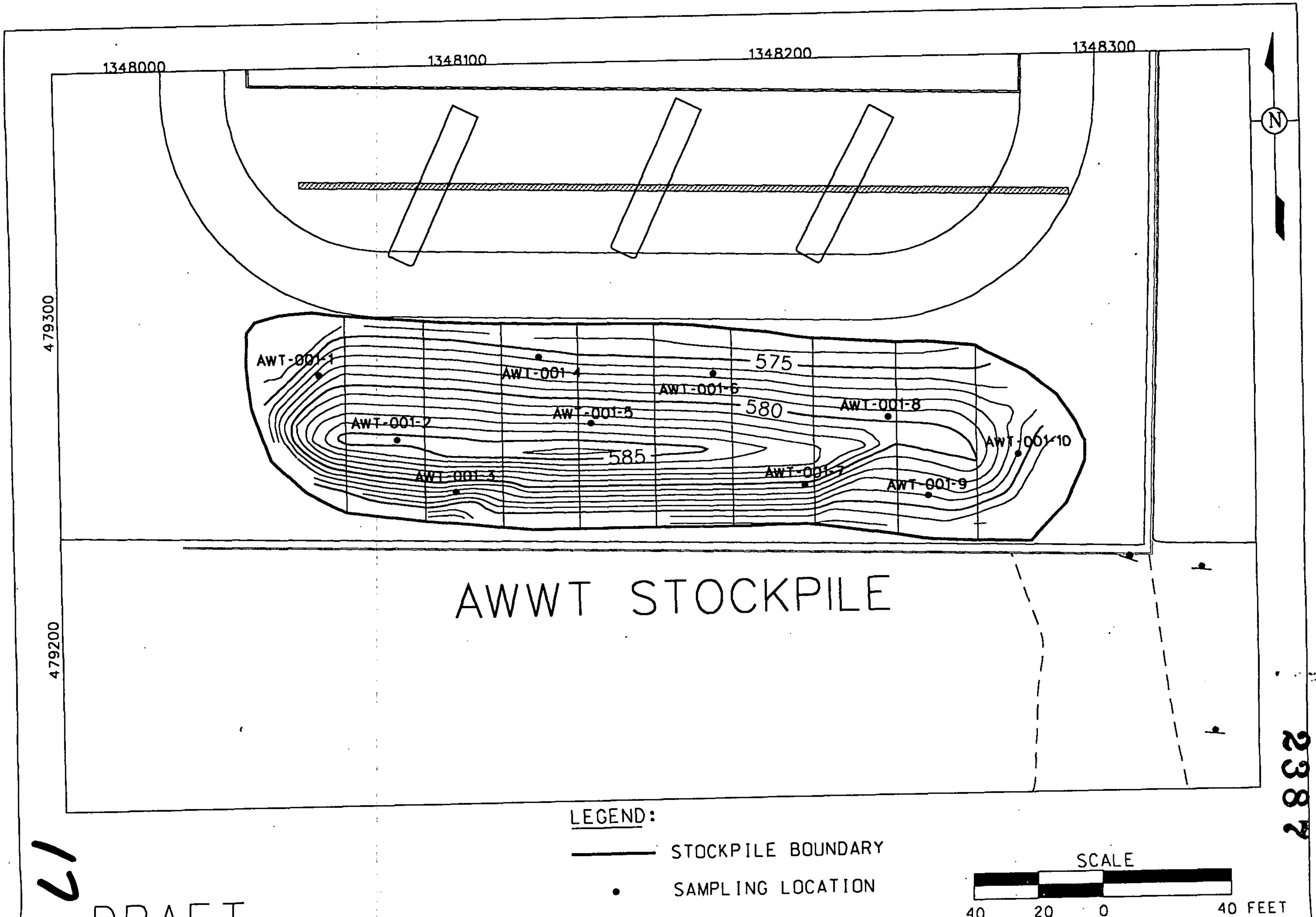
Samples will be processed in accordance with SMPL-01, *Solids Sampling*, to ensure they are documented properly and chain of custody and sample integrity are maintained. All samples will be transported from the field to the on-site Sample Processing Laboratory for analyses.

TABLE 2-1
SAMPLING AND ANALYTICAL REQUIREMENTS

Analyte	TAL	Sample Matrix	Lab	ASL*	Preservative	Holding Time	Container	Sample Mass (minimum)
Total Uranium Technetium-99	A, B	Solid	On-site	B	None	12 months	250-milliliter (mL) plastic or glass	40g
Archive	N/A	Solid	N/A	N/A	None	12 months	250-mL plastic or glass	N/A

* Analytical Support Level

Note: Sample container sizes may be changed in the field at the Field Sampling Lead's discretion.



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v:#5cj32#dgn#51_bound_a.dgn
STATE PLANAR COORDINATE SYSTEM 1983
CONTOUR ELEVATIONS IN FEET ABOVE MSL

08-JUL-1999

FIGURE 2-1. AWWT STOCKPILE SAMPLING LOCATIONS

3.0 REAL-TIME RADIOLOGICAL SCANNING

The real-time total uranium WAC investigation of surface soil in the AWWT stockpile will be performed to cover as much of the stockpile surface as practical using the high-purity germanium (HPGe) portable detectors or the mobile Radiation Measurement System (RMS). The RMS consists of either the Real-Time Tracking System (RTRAK) or the Radiation Scanning System (RSS). The majority of coverage will be completed with the RSS, due to the steepness of the stockpile. The final aerial coverage will be documented and reported upon completion of the RTIMP.

Real-time data gathered during this activity will be reported on an Excavation Monitoring Form (FS-F-5195, see Figure 3-1), which contains information on real-time data, characterization review of the data, and WAO acceptance of the characterization. The instructions for using this form are printed on the form. The Real-Time Field Lead, the Characterization Lead, and WAO representative or designees will complete this form. The original forms will be placed in the WAO files.

3.1 RADIATION MEASUREMENT SYSTEM SCANNING COVERAGE

Real-time sodium iodide detector system coverage using the RMS will be limited to safely accessible surfaces and will be used as extensively as possible without jeopardizing worker safety. The RTIMP Field Lead, Characterization Lead, and project health and safety representative will jointly determine which areas are accessible based on field conditions at the time of measurements.

The RMS spectral acquisition time will be set to 4 seconds and the data will be collected at a speed of one mile per hour. The onboard Global Positioning System (GPS) will be used to obtain positioning information with each detector measurement. The RMS scan data will be reviewed to determine if any single measurement exceeds 721 milligram per kilogram (mg/kg) total uranium, the single measurement trigger level for RMS WAC measurements established in the *User Guidelines, Measurement Strategies, and Operational Factors for Deployment of In-Situ Gamma Spectrometry at the Fernald Site* (User's Manual). If this trigger is exceeded, an HPGe measurement may be taken to confirm the RMS measurement (as discussed in Section 3.4).

3.2 HPGe DETECTOR MEASUREMENTS

The HPGe portable detector systems will be used to obtain gamma measurements in those areas that cannot be safely accessed by the RMS but are accessible to the HPGe detector (e.g., steep side slopes). The objective of the HPGe measurements is to cover the areas of the pile that were not scanned by the RMS, with the goal of covering as much of the surface of the pile as possible using real-time methods.

The HPGe detector system spectral acquisition time will be set to 300 seconds (5 minutes). The detector height will be set at 1 meter above ground surface. The height may be adjusted to ensure stockpile coverage only. All HPGe locations will be surveyed and marked. Each HPGe measurement will be identified as specified in Section 3.5.

One duplicate measurement will be taken for every 20 HPGe measurements collected for this project. The duplicate will immediately follow the original reading and will be conducted using the same detector with the same height and spectral acquisition time.

The HPGe data will be reviewed by the Characterization Lead or designee to determine if any single measurement exceeds 400 mg/kg total uranium, the trigger level established for HPGe WAC measurements at a 1-meter height as established in the User's Manual. If this trigger is exceeded, an additional HPGe measurement at a lower detector height will be taken, as discussed in Section 3.4.

3.3 SURFACE MOISTURE MEASUREMENTS

Surface moisture measurements are used to correct *in situ* RTIMP equipment gamma spectroscopy measurement data in order to report data on a dry weight basis prior to mapping. Surface moisture measurements will be collected with an *in situ* moisture measurement instrument (i.e., Troxler® moisture gauge or Zeltex Infrared Moisture Meter) within 8 hours of collecting the *in situ* RTIMP equipment gamma spectroscopy measurement data. Moisture measurements may be taken more frequently if ambient weather or soil moisture conditions change or are expected to change. Field conditions (such as weather) will be noted on the applicable electronic field worksheet. If a moisture measurement cannot be taken, a physical core sample may be collected for moisture analysis in the lab or a default moisture value of 20 percent may be used.

3.4 DETERMINING NEED FOR ADDITIONAL HPGe MEASUREMENTS

If RMS scans or 1-meter detector height HPGe measurements are greater than trigger level concentrations, confirmation and delineation may be required. This confirmation and delineation process is documented in Section 3.4 of the User's Manual. The circumscribed boundary of the RMS or 1-meter HPGe measurement above trigger limits will be located and marked (flags and/or stakes) on the surface of the stockpile by the Characterization and/or Survey Lead or designee. The location of the maximum activity will be identified by the RTIMP personnel in the field using a hand-held frisker or equivalent instrument.

HPGe detectors will be used for all confirmation and delineation measurements. Confirmation measurements shall be made using detector heights of 15 cm and/or 31 cm (depending on required field of view) and a spectral acquisition time of 5 minutes at the suspect above-WAC location to reliably determine above-WAC boundaries. If either the 15 cm or the 31 cm confirmation measurement exceeds the trigger level of 928 parts per million (ppm) as established in the User's Manual, the area exceeding the trigger level (i.e., above-WAC) shall be further delineated with the HPGe. The boundary of confirmed above-WAC material area shall be refined (delineated) using a detector height of 15 cm with a spectral acquisition time of five minutes on a 2-meter triangular grid covering the entire area indicated by the detection and confirmation measurements. The above-WAC area boundary will be defined by HPGe measurements that are lower than the HPGe WAC trigger levels.

Confirming the extent of contamination will be done with 31 cm and 15 cm HPGe measurements. The extent of delineation is at the discretion of the Characterization Lead or designee. Conditions may arise which warrant a different decision process for defining the extent of contamination (i.e., cost effectiveness, need for timely response, obvious discoloration in the soil, or other suspect above-WAC material may require physical sampling). The decision process for the unusual conditions will be documented in applicable Field Activity Logs and, if determined to be appropriate by the Characterization Lead or designee, with a V/FCN (as described in Section 4.4).

Duplicate confirmation and delineation measurements will be performed in the same manner described in Section 3.2 (one per 20 measurements taken).

3.5 REAL-TIME MEASUREMENT IDENTIFICATION

The data from each batch run with the RMS will be uniquely identified. This identifier will consist of a prefix designating the area name (AWT-001) followed by the batch number, which is assigned by RTIMP. For example:

AWT-001-265 would be batch 265 on the AWWT stockpile

Each HPGe measurement will have a unique identifier. This identifier will consist of a prefix designating the area name (AWT-001), followed by a sequential sample number within the area (1 through x), followed by a letter designating the type of sample ("G" for gamma). A "D" will be used to designate the duplicate measurements. For example:

AWT-001-2-G-D is the second HPGe reading taken in the AWWT stockpile and is a duplicate measurement

3.6 DATA MAPPING

As the measurements are acquired by the Survey and Real-Time Teams, the data will be electronically loaded into mapping software through manual file transfer or Ethernet. A set of maps and/or data summaries will be given to the Characterization Lead and WAO. Maps will be generated showing Northing (Y) and Easting (X) coordinate values, as determined using standard survey practices and standard positioning instrumentation (electronic total stations and GPS receivers). Two types of maps may be generated: a surface scan coverage map and/or an HPGe confirmation/delineation map.

Surface Scan Coverage Map(s)

- RMS Location Map - shows field of view squares that are color-coded to distinguish concentrations above the trigger level described in this PSP for total uranium concentration; denotes batch numbers in title.
- HPGe Location Map - shows field of view circles that are color-coded to distinguish concentrations above the trigger level for total uranium concentration; denotes identification number for each HPGe measurement. Includes data printout summarizing each HPGe measurement parameters and shows total uranium concentration.

(Note both results can be shown on the same map)

HPGe Confirmation/Delineation Map(s)

- HPGe Location Map - shows field of view circles that are color-coded to distinguish concentrations above the trigger level for total uranium concentration; denotes identification number for each HPGe measurement. Includes data printout summarizing each HPGe measurement parameters and showing total uranium concentration.

The map and/or HPGe data summary printouts will be used to provide the Characterization Lead and WAO or designee(s) with information to determine if additional scanning, confirmation, or delineation measurements are required.

3.7 SAMPLE COLLECTION BASED ON RMS AND HPGe MEASUREMENTS

If RMS identifies an area of surface soil above the trigger level discussed in Section 3.1 and the stockpile slope prohibits the use of HPGe to confirm and delineate the potential above-WAC area, a surface soil sample (0 to 0.5 feet) will be collected from a location within the area which exhibits the highest gross beta/gamma reading based on a portable survey meter/probe. This surface soil sample will be analyzed for total uranium (Appendix D, TAL B). If this sample indicates an above-WAC result, four additional bounding borings in a 5-foot radius will be collected to further delineate the above-WAC boundary. If a surface sample is collected, it will be identified using the following identification scheme:

AWT-001-RMS-B1

where:	AWT-001	=	AWWT Stockpile location
	RMS-B1	=	consecutively numbered biased sample collected based on an elevated RMS measurement.

Note: The sample location (northing and easting) will documented on a V/FCN.

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EXCAVATION MONITORING

1. Area Description: ______________________ Area ID (e.g. Lift Area / SA /other): ______________

Comments: ______________________________________ PWID #: ______________

2. *Section 1 - Data Collection*

Equipment Used: ☐ RTRAK ☐ RSS ☐ GATOR ☐ HPGe Unit No: ________

Calibration Acceptable ☐ Yes Date: ____________

Note: If not in calibration, do not use equipment until calibration is acceptable

3. RTRAK / RSS/ GATOR	4. HPGe
Location Map attached? ☐ Yes ☐ No	Summary Data Report attached? ☐ Yes ☐ No Location Map attached? ☐ Yes ☐ No
List of Batch #s: Coverage in accordance with PSP? ☐ Yes ☐ No If "No": ☐ Equipment Malfunction ☐ Weather ☐ Rough Terrain ☐ Standing Water ☐ Other: ______________ Data Verification Checklist attached? ☐ Yes ☐ No	List of Data Points if Summary Data Report is not attached: Identifier — Total Uranium Result (ppm) — Identifier — Total Uranium Result (ppm) Data Verification Checklist attached? ☐ Yes ☐ No

5. This signature indicates the data generated for this area by this equipment on this day is correct and valid within the confines of equipment performance and as defined in PSP #: ______________

Name: ______________ ______________ ______________

(Printed) (Signature) (Signature Date)

6. *Section 2 - Characterization*

Review real-time data

Sufficient real-time coverage? ☐ Yes ☐ No

Further action required: ______________________________

All data points < total uranium WAC? ☐ Yes ☐ No

If no, define > WAC area(s) and extent with HPGe if applicable (see attached real-time map) as defined in PSP.

Comments (if required): ______________________________

The signature indicates this area has been characterized using the real-time data generated in Section 1 above and in accordance with PSP listed in Box 5.

Name: ______________ ______________ ______________

(Printed) (Signature) (Signature Date)

7. *Section 3 - WAO*

Review attached documentation ☐ Yes MTL Designation: ______________

This signature indicates this area can be excavated and dispositioned in accordance with the characterization provided in Section 2 above. ☐ Yes ☐ No and Reason: ______________________

Name: ______________ ______________ ______________

(Printed) (Signature) (Signature Date)

Assigned Data Group for HPGe from WAO : ________

FS-F-5195
REV. 2: 05/17/99

Instructions for form completion on reverse

FIGURE 3-1 EXCAVATION MONITORING FORM

Instructions for the Excavation Monitoring Form: 2387

Box 1 Enter the Area Description (excavation area), Area ID [e.g Lift Area / Suspect Above-WAC Material (SM) / Other], Comments (if additional clarification is required) and PWID No.

Box 2 Check all the equipment used and enter the identification number for the detector used. If equipment is not in calibration, do not use until calibration is acceptable. Check yes if the calibration is acceptable and enter the date the calibration was performed.

Box 3 Check yes or no if a RTRAK/RSS/GATOR location map is attached. List the Batch Numbers associated with the referenced lift ID. Check yes or no if coverage is in accordance with the PSP. If the answer is no, give the reason that coverage was not in accordance with the PSP. If 'Other' is chosen as the reason, add a description of the reason. Check yes or no if the data verification checklist is attached. If the data verification checklist is not attached, explain why.

Box 4 Check yes or no if a HPGe summary data report is attached. Check yes or no if a HPGe location map is attached. List all the data points associated with the identified lift if a summary data report is not attached. Check yes or no if the data verification checklist is attached. If the data verification checklist is not attached, explain why.

Box 5 Enter the appropriate PSP number. Print name, sign and date.

Box 6 Check yes or no if the real-time coverage is in accordance with applicable PSP. If the coverage is not as specified in the PSP, identify any further action required. Check yes if all the data points are less than Total Uranium WAC, if not check no. If data points are not all below WAC, define areas above-WAC and extent with HPGe (if applicable) and attaching applicable maps. Add any clarification comments if necessary. Print name, sign and date.

Box 7 Check yes if reviewed attached documentation. Enter Material Tracking Location (MTL) designator. Check yes if area can be excavated or no and explain why not. Print name, sign and date. Fill in assigned IIMS data group designator for HPGe.

NOTE:
Box 1 will be completed by the RTIMP, SCEP and/or WAO representatives.
Boxes 2-5 will be completed by the RTIMP representative.
Box 6 will be completed by the SCEP representative.
Box 7 will be completed by the WAO representative.

FIGURE 3-1 EXCAVATION MONITORING FORM

4.0 QUALITY ASSURANCE/QUALITY CONTROL REQUIREMENTS

4.1 FIELD QUALITY CONTROL SAMPLES, ANALYTICAL REQUIREMENTS, AND DATA VALIDATION

In accordance with the requirements of DQO SL-048, Rev. 5, the field quality control, analytical, and data validation requirements are as follows:

- All laboratory analyses will be performed at analytical support level (ASL) B.
- All analytical data will require a certificate of analysis and 10 percent of the analytical data will also require the associated quality assurance/quality control results. A minimum of 10 percent of the analytical data from each laboratory will be validated to ASL B. All field data forms will be validated.
- No field quality control samples are required for this PSP.
- Real-time measurements will be performed at ASL A.
- One in 20 HPGe measurements will require a duplicate.

If any sample collection or analysis methods are used that are not in accordance with the SCQ, the Project Manager and Characterization Lead must determine if the qualitative data from the samples will be beneficial to WAC attainment decision making. If the data will be beneficial, the Project Manager and Characterization Lead will ensure that:

- the PSP is revised through a V/FCN to include references confirming that the new method is sufficient to support data needs,
- variations from the SCQ methodology are documented in the PSP, or
- data validation of the affected samples is requested or qualifier codes of J (estimated) and R (rejected) be attached to detected and nondetected results, respectively.

4.2 PROJECT-SPECIFIC PROCEDURES, MANUALS, AND DOCUMENTS

To assure consistency and data integrity, field activities in support of this PSP will follow the requirements and responsibilities outlined in controlled procedures and manufacturer operational manuals. Applicable procedures and manuals include the following:

- SMPL-01, *Solids Sampling*
- SMPL-21, *Collection of Field Quality Control Samples*

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- EQT-06, *Geoprobe® Model 5400 Operation and Maintenance Manual*
- EQT-22, *Characterization of Gamma Sensitive Detectors*
- EQT-23, *Operation of ADCAM Series Analyzers with Gamma Sensitive Detectors*
- EQT-32, *Troxler® 3440 Series Surface Moisture/Density Gauge -- Calibration, Operation, and Maintenance*
- EQT-33, *Real-Time Differential Global Positioning System Operation*
- EQT-39, *Zeltex Infrared Moisture Meter*
- EQT-41, *Radiation Measurement Systems*
- EW-1023, *Management of Stockpiles*
- 34-10-501, *Shipping Samples to Off-Site Laboratories*
- *Area 2, Phase I Integrated Remedial Design Package,* Appendix D
- *Sitewide CERCLA Quality Assurance Project Plan (SCQ)*
- *Sitewide Excavation Plan (SEP)*
- *Waste Acceptance Criteria Attainment Plan for the On-Site Disposal Facility*
- *User Guidelines, Measurement Strategies, and Operational Factors for Deployment of In-Situ Gamma Spectrometry at the Fernald Site.*

4.3 PROJECT REQUIREMENTS FOR INDEPENDENT ASSESSMENTS

Project management has ultimate responsibility for the quality of the work processes and the results of the sampling activities covered by this PSP. The Quality Assurance (QA) organization will conduct independent assessments of the work process and operations to assure the quality of performance. Assessment will encompass technical and procedural requirements of this PSP and the SCQ. Independent assessments will be performed by conducting a surveillance. Surveillances will be planned and documented according to Section 12.3 of the SCQ.

4.4 IMPLEMENTATION OF FIELD CHANGES

If field conditions require changes or variances, the Field Sampling Lead must obtain written or verbal approval (electronic mail is acceptable) from the Characterization Lead, the QA Representative, and the WAO Representative before the changes may be implemented. If the change involves real-time scanning, the Real-Time Field Lead must also give written or verbal approval before the change can be implemented. Changes to the PSP will be noted in the applicable Field Activity Logs and on a V/FCN. QA must receive the completed V/FCN, which includes the signatures of the Characterization Lead, Sampling Lead, Project Manager, WAO, QA, and Real-Time Lead, if applicable, within seven working days of implementation of the change.

5.0 HEALTH AND SAFETY

The Health and Safety Lead, Field Sampling Leads, and team members will assess the safety of performing sampling activities on the surfaces of the AWWT stockpile. This will include vehicle positioning limitations, fall hazards, and vehicle stability if Geoprobe® or real-time scanning work is performed on the side slopes of the pile.

Technicians will conform to precautionary surveys performed by personnel representing the Radiological Control, Safety, and Industrial Hygiene organizations. All work on this project will be performed in accordance with applicable Environmental Monitoring procedures, RM-0021 (Safety Performance Requirements Manual), Fluor Daniel Fernald work permits, penetration permits, and other applicable permits. Concurrence with applicable safety permits (indicated by the signature of each field team member assigned to this project) is required by each team member in the performance of their assigned duties.

The Field Sampling Lead will ensure that each technician performing sampling related to this project has been trained to the relevant sampling procedures, including safety precautions. Technicians who do not sign project safety and technical briefing forms will not participate in the execution of sampling activities related to the completion of assigned project responsibilities. A copy of applicable safety permits/surveys issued for worker safety and health will be posted at the stockpile during sampling activities. A safety briefing will be conducted prior to the initiation of field activities.

All emergencies shall be reported immediately on extension 911, or to the Site Communications Center at 648-6511 (if using a cellular phone), or using a radio and contacting "CONTROL" on Channel 11.

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6.0 DATA MANAGEMENT

A data management process will be implemented to satisfy data end use requirements after completion of field activities. As specified in Section 5.1 of the SCQ, sampling teams will describe daily activities on a Field Activity Log, which should be sufficiently detailed to allow accurate reconstruction of the events at a later date without reliance on memory. Sample Collection Logs will be completed according to protocol specified in Appendix B of the SCQ and in applicable procedures. These forms will be maintained in loose-leaf form and uniquely numbered following the field sampling event. At least weekly, a copy of all field logs will be sent to the Characterization Lead.

All field measurements, observations, and sample collection information associated with physical sample collection will be recorded, as applicable, on the Sample Collection Log, the Field Activity Log, and the Chain of Custody/Request for Analysis Form as required. The sample collection method will be specified in the Field Activity Log. Borehole Abandonment Logs are not required. Real-time data will be reported on an Excavation Monitoring Form. The PSP number will be on all documentation associated with these sampling activities.

Samples will be assigned a unique sample identifier, as explained in Sections 2.4 and 3.5 and listed in Appendix C. This unique sample identifier will appear on the Sample Collection Log and Chain of Custody/Request for Analysis and will be used to identify the samples during analysis, data entry, and data management.

Technicians and the field data coordinator will review all field data for completeness and accuracy and then forward the data package to the Data Validation Contact for final review. The field data package will be filed in the records of the Environmental Management Project.

The Sample and Data Management organization will perform data entry into the Sitewide Environmental Database (SED). After data are in the SED, the Data Group Form (FS-F-5157) will be completed by a WAO representative with concurrence from the Characterization Lead. Field logs will be maintained in loose-leaf form during the field recording activities. The analytical data validation requirements are outlined in Section 4.1.

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APPENDIX A

HISTORICAL DATA

TABLE A-1
1988 AND 1993 SAMPLE RESULTS

SAMPLE ID	LOCATION ID	SAMPLE DATE	TOP DEPTH	BOTTOM DEPTH	NORTHING	EASTING	PARAMETER	RESULT	QUALIFIER	UNITS
5529	ZONE 3-42	26-Sep-88	0	0.5	479259.396	1347996	Cesium-137	0.2	U	PCI/G
5529	ZONE 3-42	26-Sep-88	0	0.5	479259.396	1347996	Neptunium-237	0.6	U	PCI/G
5529	ZONE 3-42	26-Sep-88	0	0.5	479259.396	1347996	Plutonium-238	0.6	U	PCI/G
5529	ZONE 3-42	26-Sep-88	0	0.5	479259.396	1347996	Plutonium-239/240	0.6	U	PCI/G
5529	ZONE 3-42	26-Sep-88	0	0.5	479259.396	1347996	Radium-226	1	-	PCI/G
5529	ZONE 3-42	26-Sep-88	0	0.5	479259.396	1347996	Radium-228	0.8	-	PCI/G
5529	ZONE 3-42	26-Sep-88	0	0.5	479259.396	1347996	Ruthenium-106	1	U	PCI/G
5529	ZONE 3-42	26-Sep-88	0	0.5	479259.396	1347996	Strontium-90	0.5	U	PCI/G
5529	ZONE 3-42	26-Sep-88	0	0.5	479259.396	1347996	Technetium-99	0.9	UJ	PCI/G
5529	ZONE 3-42	26-Sep-88	0	0.5	479259.396	1347996	Thorium, Total	6.384172	NV	PCI/G
5529	ZONE 3-42	26-Sep-88	0	0.5	479259.396	1347996	Thorium-228	0.8	-	PCI/G
5529	ZONE 3-42	26-Sep-88	0	0.5	479259.396	1347996	Thorium-230	1.5	-	PCI/G
5529	ZONE 3-42	26-Sep-88	0	0.5	479259.396	1347996	Thorium-232	0.7	-	PCI/G
5529	ZONE 3-42	26-Sep-88	0	0.5	479259.396	1347996	Uranium, Total	8	-	MG/KG
5529	ZONE 3-42	26-Sep-88	0	0.5	479259.396	1347996	Uranium-234	2.3	-	PCI/G
5529	ZONE 3-42	26-Sep-88	0	0.5	479259.396	1347996	Uranium-235/236	0.6	U	PCI/G
5529	ZONE 3-42	26-Sep-88	0	0.5	479259.396	1347996	Uranium-238	2.4	-	PCI/G
5528	ZONE 3-42	19880926	0	0.5	479279.365	1348011	Cesium-137	0.2	U	pCi/g
5528	ZONE 3-42	19880926	0	0.5	479279.365	1348011	Neptunium-237	0.6	U	pCi/g
5528	ZONE 3-42	19880926	0	0.5	479279.365	1348011	Plutonium-238	0.6	U	pCi/g
5528	ZONE 3-42	19880926	0	0.5	479279.365	1348011	Plutonium-239/240	0.6	U	pCi/g
5528	ZONE 3-42	19880926	0	0.5	479279.365	1348011	Radium-226	0.9	-	pCi/g
5528	ZONE 3-42	19880926	0	0.5	479279.365	1348011	Radium-228	0.8	-	pCi/g
5528	ZONE 3-42	19880926	0	0.5	479279.365	1348011	Ruthenium-106	1	U	pCi/g
5528	ZONE 3-42	19880926	0	0.5	479279.365	1348011	Strontium-90	0.5	U	pCi/g
5528	ZONE 3-42	19880926	0	0.5	479279.365	1348011	Technetium-99	1	UJ	pCi/g
5528	ZONE 3-42	19880926	0	0.5	479279.365	1348011	Thorium-228	0.7	-	pCi/g
5528	ZONE 3-42	19880926	0	0.5	479279.365	1348011	Thorium-230	1.6	-	pCi/g
5528	ZONE 3-42	19880926	0	0.5	479279.365	1348011	Thorium-232	0.7	-	pCi/g
5528	ZONE 3-42	19880926	0	0.5	479279.365	1348011	Uranium, Total	6.296943	-	mg/kg
5528	ZONE 3-42	19880926	0	0.5	479279.365	1348011	Uranium-234	2	-	pCi/g
5528	ZONE 3-42	19880926	0	0.5	479279.365	1348011	Uranium-235/236	0.6	U	pCi/g
5528	ZONE 3-42	19880926	0	0.5	479279.365	1348011	Uranium-238	2.1	-	pCi/g
6064	ZONE 2-37	19881026	0	0.5	479279.368	1348281	Cesium-137	0.4	-	pCi/g
6064	ZONE 2-37	19881026	0	0.5	479279.368	1348281	Neptunium-237	0.6	U	pCi/g
6064	ZONE 2-37	19881026	0	0.5	479279.368	1348281	Plutonium-238	0.6	U	pCi/g

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TABLE A-1
1988 AND 1993 SAMPLE RESULTS

SAMPLE ID	LOCATION ID	SAMPLE DATE	TOP DEPTH	BOTTOM DEPTH	NORTHING	EASTING	PARAMETER	RESULT	QUALIFIER	UNITS
6064	ZONE 2-37	19881026	0	0.5	479279.368	1348281	Plutonium-239/240	0.6	U	pCi/g
6064	ZONE 2-37	19881026	0	0.5	479279.368	1348281	Radium-226	1	-	pCi/g
6064	ZONE 2-37	19881026	0	0.5	479279.368	1348281	Radium-228	1.3	-	pCi/g
6064	ZONE 2-37	19881026	0	0.5	479279.368	1348281	Ruthenium-106	1	U	pCi/g
6064	ZONE 2-37	19881026	0	0.5	479279.368	1348281	Strontium-90	0.5	UJ	pCi/g
6064	ZONE 2-37	19881026	0	0.5	479279.368	1348281	Technetium-99	1	UJ	pCi/g
6064	ZONE 2-37	19881026	0	0.5	479279.368	1348281	Thorium-228	1.3	-	pCi/g
6064	ZONE 2-37	19881026	0	0.5	479279.368	1348281	Thorium-230	1.4	-	pCi/g
6064	ZONE 2-37	19881026	0	0.5	479279.368	1348281	Thorium-232	0.8	-	pCi/g
6064	ZONE 2-37	19881026	0	0.5	479279.368	1348281	Uranium, Total	29.08588	-	mg/kg
6064	ZONE 2-37	19881026	0	0.5	479279.368	1348281	Uranium-234	9.5	-	pCi/g
6064	ZONE 2-37	19881026	0	0.5	479279.368	1348281	Uranium-235/236	0.6	U	pCi/g
6064	ZONE 2-37	19881026	0	0.5	479279.368	1348281	Uranium-238	9.7	-	pCi/g
121089	SS-39	19930707	0	0.5	479207.638	1348310	1,1,1-Trichloroethane	12	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	1,1,2,2-Tetrachloroethane	12	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	1,1,2-Trichloroethane	12	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	1,1-Dichloroethane	12	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	1,1-Dichloroethene	12	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	1,2,4-Trichlorobenzene	410	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	1,2-Dichlorobenzene	410	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	1,2-Dichloroethane	12	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	1,2-Dichloroethene (Total)	12	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	1,2-Dichloropropane	12	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	1,3-Dichlorobenzene	410	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	1,4-Dichlorobenzene	410	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	2,4,5-Trichlorophenol	1000	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	2,4,6-Trichlorophenol	410	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	2,4-Dichlorophenol	410	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	2,4-Dimethylphenol	410	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	2,4-Dinitrotoluene	410	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	2,6-Dinitrotoluene	410	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	2-Chloronaphthalene	410	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	2-Chlorophenol	410	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	2-Methylnaphthalene	410	UJ	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	2-Nitroaniline	1000	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	2-Nitrophenol	410	U	ug/kg

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TABLE A-1
1988 AND 1993 SAMPLE RESULTS

SAMPLE ID	LOCATION ID	SAMPLE DATE	TOP DEPTH	BOTTOM DEPTH	NORTHING	EASTING	PARAMETER	RESULT	QUALIFIER	UNITS
121089	SS-39	19930707	0	0.5	479207.638	1348310	3,3'-Dichlorobenzidine	410	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	3-Nitroaniline	1000	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	4,4'-DDD	8.1	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	4,4'-DDE	8.1	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	4,4'-DDT	8.1	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	4,6-Dinitro-2-methylphenol	1000	UJ	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	4-Bromophenyl phenyl ether	410	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	4-Chloro-3-methylphenol	410	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	4-Chlorophenylphenyl ether	410	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	4-Nitroaniline	1000	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	4-Nitrophenol	1000	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Acenaphthene	410	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Acenaphthylene	410	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Acetone	12	UJ	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Aldrin	4.2	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	alpha-BHC	4.2	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	alpha-Chlordane	4.2	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Aluminum	12300	-	mg/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Anthracene	410	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Antimony	3.5	U	mg/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Aroclor-1016	81	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Aroclor-1221	170	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Aroclor-1232	81	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Aroclor-1242	81	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Aroclor-1248	81	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Aroclor-1254	81	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Aroclor-1260	81	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Arsenic	6.1	-	mg/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Barium	87.5	-	mg/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Benzene	12	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Benzo(a)anthracene	410	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Benzo(a)pyrene	410	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Benzo(b)fluoranthene	410	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Benzo(g,h,i)perylene	410	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Benzo(k)fluoranthene	410	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Benzoic acid	1000	U	ug/kg

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TABLE A-1
1988 AND 1993 SAMPLE RESULTS

SAMPLE ID	LOCATION ID	SAMPLE DATE	TOP DEPTH	BOTTOM DEPTH	NORTHING	EASTING	PARAMETER	RESULT	QUALIFIER	UNITS
121089	SS-39	19930707	0	0.5	479207.638	1348310	Benzyl alcohol	410	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Beryllium	1.2	U	mg/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	beta-BHC	4.2	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	bis(2-Chloroethoxy)methane	410	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	bis(2-Chloroethyl)ether	410	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	bis(2-Chloroisopropyl) ether	410	UJ	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	bis(2-Ethylhexyl)phthalate	410	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Bromodichloromethane	12	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Bromoform	12	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Bromomethane	12	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Butyl benzyl phthalate	410	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Cadmium	1.2	U	mg/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Calcium	7350	-	mg/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Carbon disulfide	12	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Carbon Tetrachloride	12	U	ug/kg
121090	SS-39	19930707	0	0.5	479207.638	1348310	Cesium-137	1.3	J	pCi/g
121089	SS-39	19930707	0	0.5	479207.638	1348310	Chlorobenzene	12	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Chloroethane	12	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Chloroform	12	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Chloromethane	12	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Chromium	14.4	-	mg/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Chrysene	410	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	cis-1,3-Dichloropropene	12	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Cobalt	7.7	-	mg/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Copper	15.2	-	mg/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Cyanide	0.34	J	mg/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	delta-BHC	4.2	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Dibenzo(a,h)anthracene	410	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Dibenzofuran	410	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Dibromochloromethane	12	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Dieldrin	8.1	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Diethyl phthalate	410	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Dimethyl phthalate	410	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Di-n-butyl phthalate	410	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Di-n-octyl phthalate	410	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Endosulfan II	8.1	U	ug/kg

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TABLE A-1
1988 AND 1993 SAMPLE RESULTS

SAMPLE ID	LOCATION ID	SAMPLE DATE	TOP DEPTH	BOTTOM DEPTH	NORTHING	EASTING	PARAMETER	RESULT	QUALIFIER	UNITS
121089	SS-39	19930707	0	0.5	479207.638	1348310	Endosulfan sulfate	8.1	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Endosulfan-I	4.2	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Endrin	8.1	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Endrin aldehyde	8.1	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Endrin ketone	8.1	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Ethylbenzene	12	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Fluoranthene	43	J	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Fluorene	410	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	gamma-BHC (Lindane)	4.2	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	gamma-Chlordane	4.2	U	ug/kg
121090	SS-39	19930707	0	0.5	479207.638	1348310	Gross Alpha	18.2	NV	pCi/g
121090	SS-39	19930707	0	0.5	479207.638	1348310	Gross Beta	37.5	NV	pCi/g
121089	SS-39	19930707	0	0.5	479207.638	1348310	Heptachlor	4.2	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Heptachlor epoxide	4.2	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Hexachlorobenzene	410	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Hexachlorobutadiene	410	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Hexachlorocyclopentadiene	410	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Hexachloroethane	410	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Indeno(1,2,3-cd)pyrene	410	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Iron	18100	-	mg/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Isophorone	410	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Magnesium	3580	-	mg/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Manganese	386	-	mg/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Mercury	0.06	UJ	mg/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Methoxychlor	42	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Methylene chloride	12	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Molybdenum	4.2	U	mg/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Naphthalene	410	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Nickel	12.2	-	mg/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Nitrobenzene	410	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	N-Nitroso-di-n-propylamine	410	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	N-Nitrosodiphenylamine	410	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	o-Methylphenol	410	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	p-Chloroaniline	410	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Pentachlorophenol	1000	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Phenanthrene	410	U	ug/kg

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TABLE A-1
1988 AND 1993 SAMPLE RESULTS

SAMPLE ID	LOCATION ID	SAMPLE DATE	TOP DEPTH	BOTTOM DEPTH	NORTHING	EASTING	PARAMETER	RESULT	QUALIFIER	UNITS
121089	SS-39	19930707	0	0.5	479207.638	1348310	Phenol	410	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	p-Methylphenol	410	UJ	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Potassium	1110	-	mg/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Pyrene	410	U	ug/kg
121090	SS-39	19930707	0	0.5	479207.638	1348310	Radium-226	0.7	J	pCi/g
121090	SS-39	19930707	0	0.5	479207.638	1348310	Radium-228	0.6	-	pCi/g
121089	SS-39	19930707	0	0.5	479207.638	1348310	Silicon	335	-	mg/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Silver	0.49	U	mg/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Sodium	89.2	U	mg/kg
121090	SS-39	19930707	0	0.5	479207.638	1348310	Strontium-90	1.7	UJ	pCi/g
121089	SS-39	19930707	0	0.5	479207.638	1348310	Styrene	12	U	ug/kg
121090	SS-39	19930707	0	0.5	479207.638	1348310	Technetium-99	1	UJ	pCi/g
121089	SS-39	19930707	0	0.5	479207.638	1348310	Tetrachloroethene	12	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Thallium	0.25	U	mg/kg
121090	SS-39	19930707	0	0.5	479207.638	1348310	Thorium-228	0.9	J	pCi/g
121090	SS-39	19930707	0	0.5	479207.638	1348310	Thorium-230	1.7	J	pCi/g
121090	SS-39	19930707	0	0.5	479207.638	1348310	Thorium-232	0.8	J	pCi/g
121089	SS-39	19930707	0	0.5	479207.638	1348310	Toluene	12	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Toxaphene	420	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	trans-1,3-Dichloropropene	12	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Trichloroethene	12	U	ug/kg
121090	SS-39	19930707	0	0.5	479207.638	1348310	Uranium, Total	11.39447	J	mg/kg
121090	SS-39	19930707	0	0.5	479207.638	1348310	Uranium-234	2.8	J	pCi/g
121090	SS-39	19930707	0	0.5	479207.638	1348310	Uranium-235/236	0.1	UJ	pCi/g
121090	SS-39	19930707	0	0.5	479207.638	1348310	Uranium-238	3.8	J	pCi/g
121089	SS-39	19930707	0	0.5	479207.638	1348310	Vanadium	23.4	-	mg/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Vinyl Acetate	12	UJ	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Vinyl chloride	12	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Xylenes, Total	12	U	ug/kg
121089	SS-39	19930707	0	0.5	479207.638	1348310	Zinc	85.1	-	mg/kg

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TABLE A-2
1992 SAMPLE RESULTS

SAMPLE NUMBER	DATE SAMPLED	ANALYSIS	RESULT	UNITS
920812-086	8/12/92	Alpha Activity - ISO RAD	<15	pCi/g
920812-086	8/12/92	Beta Activity - ISO RAD	<35	pCi/g
920812-086	8/12/92	Total Th - XRF AnL	<18	ppm dry
920812-086	8/12/92	Total U - XRF AnL	19	ppm dry
920812-087	8/12/92	Alpha Activity - ISO RAD	<17	pCi/g
920812-087	8/12/92	Beta Activity - ISO RAD	<40	pCi/g
920812-087	8/12/92	Total Th - XRF AnL	<18	ppm dry
920812-087	8/12/92	Total U - XRF AnL	<11	ppm dry
920813-122	8/13/92	Alpha Activity - ISO RAD	<27	pCi/g
920813-122	8/13/92	Beta Activity - ISO RAD	<48	pCi/g
920813-122	8/13/92	Total Th - XRF AnL	18	ug/g dry
920813-122	8/13/92	Total U - XRF AnL	51	ug/g dry
920813-123	8/13/92	Alpha Activity - ISO RAD	<27	pCi/g
920813-123	8/13/92	Beta Activity - ISO RAD	<48	pCi/g
920813-123	8/13/92	Total Th - XRF AnL	48	ug/g dry
920813-123	8/13/92	Total U - XRF AnL	<11	ug/g dry
920813-124	8/13/92	Alpha Activity - ISO RAD	<27	pCi/g
920813-124	8/13/92	Beta Activity - ISO RAD	<48	pCi/g
920813-124	8/13/92	Total Th - XRF AnL	25	ug/g dry
920813-124	8/13/92	Total U - XRF AnL	<11	ug/g dry
920813-125	8/13/92	Alpha Activity - ISO RAD	<27	pCi/g
920813-125	8/13/92	Beta Activity - ISO RAD	<48	pCi/g
920813-125	8/13/92	Total Th - XRF AnL	<18	ug/g dry
920813-125	8/13/92	Total U - XRF AnL	<11	ug/g dry
920813-127	8/13/92	Total Th - XRF AnL	<18	ug/g dry
920813-127	8/13/92	Total U - XRF AnL	14	ug/g dry
920813-128	8/13/92	Alpha Activity - ISO RAD	<27	pCi/g
920813-128	8/13/92	Beta Activity - ISO RAD	<48	pCi/g
920813-128	8/13/92	Total Th - XRF AnL	<18	ug/g dry
920813-128	8/13/92	Total U - XRF AnL	<11	ug/g dry
920813-129	8/13/92	Alpha Activity - ISO RAD	<27	pCi/g
920813-129	8/13/92	Beta Activity - ISO RAD	<48	pCi/g
920813-129	8/13/92	Total Th - XRF AnL	<18	ug/g dry
920813-129	8/13/92	Total U - XRF AnL	<11	ug/g dry
920817-158	8/17/92	Alpha Activity - ISO RAD	<27	pCi/g
920817-158	8/17/92	Beta Activity - ISO RAD	<45	pCi/g
920817-158	8/17/92	Total Th - XRF AnL	<18	ug/g dry
920817-158	8/17/92	Total U - XRF AnL	<11	ug/g dry
920817-159	8/17/92	Alpha Activity - ISO RAD	<23	pCi/g
920817-159	8/17/92	Beta Activity - ISO RAD	<40	pCi/g
920817-159	8/17/92	Total Th - XRF AnL	<18	ug/g dry
920817-159	8/17/92	Total U - XRF AnL	12	ug/g dry
920817-160	8/17/92	Alpha Activity - ISO RAD	<26	pCi/g
920817-160	8/17/92	Beta Activity - ISO RAD	<44	pCi/g
920817-160	8/17/92	Total Th - XRF AnL	<18	ug/g dry
920817-160	8/17/92	Total U - XRF AnL	13	ug/g dry
920818-115	8/18/92	Alpha Activity - ISO RAD	<23	pCi/g
920818-115	8/18/92	Beta Activity - ISO RAD	<40	pCi/g
920818-115	8/18/92	Total Th - XRF AnL	<18	ug/g dry

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TABLE A-2
1992 SAMPLE RESULTS

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SAMPLE NUMBER	DATE SAMPLED	ANALYSIS	RESULT	UNITS
920818-115	8/18/92	Total U - XRF AnL	34	ug/g dry
920818-116	8/18/92	Alpha Activity - ISO RAD	<23	pCi/g
920818-116	8/18/92	Beta Activity - ISO RAD	<39	pCi/g
920818-116	8/18/92	Total Th - XRF AnL	<18	ug/g dry
920818-116	8/18/92	Total U - XRF AnL	<11	ug/g dry
920818-117	8/18/92	Alpha Activity - ISO RAD	<27	pCi/g
920818-117	8/18/92	Beta Activity - ISO RAD	47	pCi/g
920818-117	8/18/92	Total Th - XRF AnL	<18	ug/g dry
920818-117	8/18/92	Total U - XRF AnL	11	ug/g dry
920818-118	8/18/92	Alpha Activity - ISO RAD	<26	pCi/g
920818-118	8/18/92	Beta Activity - ISO RAD	<44	pCi/g
920818-118	8/18/92	Total Th - XRF AnL	19	ug/g dry
920818-118	8/18/92	Total U - XRF AnL	15	ug/g dry
920818-120	8/18/92	Alpha Activity - ISO RAD	<25	pCi/g
920818-120	8/18/92	Beta Activity - ISO RAD	<43	pCi/g
920818-120	8/18/92	Total Th - XRF AnL	<18	ug/g dry
920818-120	8/18/92	Total U - XRF AnL	14	ug/g dry
920818-121	8/18/92	Alpha Activity - ISO RAD	<24	pCi/g
920818-121	8/18/92	Beta Activity - ISO RAD	<40	pCi/g
920818-121	8/18/92	Total Th - XRF AnL	<18	ug/g dry
920818-121	8/18/92	Total U - XRF AnL	11	ug/g dry

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APPENDIX B

DATA QUALITY OBJECTIVES SL-048, REV. 5

Control Number: 2387

Fernald Environmental Management Project

Data Quality Objectives

Title: Delineating the Extent of Constituents of Concern During Remediation Sampling

Number: SL-048

Revision: 5

Effective Date: February 26, 1999

Contact Name: Eric Kroger

Approval: (signature on file) Date: 2/25/99
James E. Chambers
DQO Coordinator

Approval: (signature on file) Date: 2/26/99
J.D. Chiou
SCEP Project Director

Rev. #	0	1	2	3	4	5	6
Effective Date:	9/19/97	10/3/97	4/15/98	6/17/98	7/14/98	2/26/99	

DATA QUALITY OBJECTIVES

Delineating the Extent of Constituents of Concern During Remediation Sampling

Members of Data Quality Objectives (DQO) Scoping Team

The members of the DQO team include a project lead, a project engineer, a field lead, a statistician, a lead chemist, a sampling supervisor, and a data management lead.

Conceptual Model of the Site

Media is considered contaminated if the concentration of a constituent of concern (COC) exceeds the final remediation levels (FRLs). The extent of specific media contamination was estimated and published in the Operable Unit 5 Feasibility Study (FS). These estimates were based on kriging analysis of available data for media collected during the Remedial Investigation (RI) effort and other FEMP environmental characterization studies. Maps outlining contaminated media boundaries were generated for the Operable Unit 5 FS by overlaying the results of the kriging analysis data with isoconcentration maps of the other constituents of concern (COCs), as presented in the Operable Unit 5 RI report, and further modified by spatial analysis of maps reflecting the most current media characterization data. A sequential remediation plan has been presented that subdivides the FEMP into seven construction areas. During the course of remediation, areas of specific media may require additional characterization so remediation can be carried out as thoroughly and efficiently as possible. As a result, additional sampling may be necessary to accurately delineate a volume of specific media as exceeding a target level, such as the FRL or the Waste Attainment Criterion (WAC). Each individual Project-Specific Plan (PSP) will identify and describe the particular media to be sampled. This DQO covers all physical sampling activities associated with Pre-design Investigations, precertification sampling, WAC attainment sampling or regulatory monitoring that is required during site remediation.

1.0 Statement of Problem

If the extent (depth and/or area) of the media COC contamination is unknown, then it must be defined with respect to the appropriate target level (FRL, WAC, or other specified media concentration).

2.0 Identify the Decision

Delineate the horizontal and/or vertical extent of media COC contamination in an area with respect to the appropriate target level.

3.0 Inputs That Affect the Decision

Informational Inputs - Historical data, process history knowledge, the modeled extent of COC contamination, and the origins of contamination will be required to establish a sampling plan to delineate the extent of COC contamination. The desired precision of the delineation must be weighed against the cost of collecting and analyzing additional samples in order to determine the optimal sampling density. The project-specific plan will identify the optimal sampling density.

Action Levels - COCs must be delineated with respect to a specific action level, such as FRLs and On-Site Disposal Facility (OSDF) WAC concentrations. Specific media FRLs are established in the OU2 and OU5 RODs, and the WAC concentrations are published in the OU5 ROD. Media COCs may also require delineation with respect to other action levels that act as remediation drivers, such as Benchmark Toxicity Values (BTVs).

4.0 The Boundaries of the Situation

Temporal Boundaries - Sampling must be completed within a time frame sufficient to meet the remediation schedule. Time frames must allow for the scheduling of sampling and analytical activities, the collection of samples, analysis of samples and the processing of analytical data when received.

Scale of Decision Making - The decision made based upon the data collected in this investigation will be the extent of COC contamination at or above the appropriate action level. This delineation will result in media contaminant concentration information being incorporated into engineering design, and the attainment of established remediation goals.

Parameters of Interest - The parameters of interest are the COCs that have been determined to require additional delineation before remediation design can be finalized with the optimal degree of accuracy.

5.0 Decision Rule

If existing data provide an unacceptable level of uncertainty in the COC delineation model, then additional sampling will take place to decrease the model uncertainty. When deciding what additional data is needed, the costs of additional sampling and analysis must be weighed against the benefit of reduced uncertainty in the delineation model, which will eventually be used for assigning excavation, or for other purposes.

6.0 Limits on Decision Errors

In order to be useful, data must be collected with sufficient areal and depth coverage, and at sufficient density to ensure an accurate delineation of COC concentrations. Analytical sensitivity and reproducibility must be sufficient to differentiate the COC concentrations below their respective target levels.

Types of Decision Errors and Consequences

Decision Error 1 - This decision error occurs when the decision maker determines that the extent of media contaminated with COCs above action levels is not as extensive as it actually is. This error can result in a remediation design that fails to incorporate media contaminated with COC(s) above the action level(s). This could result in the re-mobilization of excavation equipment and delays in the remediation schedule. Also, this could result in media contaminated above action levels remaining after remediation is considered complete, posing a potential threat to human health and the environment.

Decision Error 2 - This decision error occurs when the decision maker determines that the extent of media contaminated above COC action levels is more extensive than it actually is. This error could result in more excavation than necessary, and this excess volume of materials being transferred to the OSDF, or an off-site disposal facility if contamination levels exceed the OSDF WAC.

True State of Nature for the Decision Errors - The true state of nature for Decision Error 1 is that the maximum extent of contamination above the FRL is more extensive than was determined. The true state of nature for Decision Error 2 is that the maximum extent of contamination above the FRL is not as extensive as was determined. Decision Error 1 is the more severe error.

7.0 Optimizing Design for Useable Data

7.1 Sample Collection

A sampling and analytical testing program will delineate the extent of COC contamination in a given area with respect to the action level of interest. Existing data, process knowledge, modeled concentration data, and the origins of contamination will be considered when determining the lateral and vertical extent of sample collection. The cost of collecting and analyzing additional samples will be weighed against the benefit of reduced uncertainty in the delineation model. This will determine the sampling density. Individual PSPs will identify the locations and depths to be sampled, the sampling density necessary to obtain the desired accuracy of the delineation, and if samples will be analyzed by the on-site or off-site laboratory. The PSP will also identify the sampling increments to be selectively analyzed for concentrations of the COC(s) of interest, along with field work requirements. Analytical requirements will be listed in the PSP. The chosen analytical methodologies are able to achieve a detection limit capable of resolving the COC action level. Sampling of groundwater monitoring wells may require different purge requirements than those stated in the SCQ (i.e., dry well definitions or small purge volumes). In order to accommodate sampling of wells that go dry prior to completing the purge of the necessary well volume, attempts to sample the monitoring wells will be made 24 hours after purging the well dry. If, after the 24 hour period, the well does not yield the required volume, the analytes will be collected in the order stated in the applicable PSP until the well goes dry. Any remaining analytes will not be collected. In some instances, after the 24 hour wait the well may not yield any water. For these cases, the well will be considered dry and will not be sampled.

7.2 COC Delineation

The media COC delineation will use all data collected under the PSP, and if deemed appropriate by the Project Lead, may also include existing data obtained from physical samples, and if applicable, information obtained through real-time screening. The delineation may be accomplished through modeling (e.g. kriging) of the COC concentration data with a confidence limit specific to project needs that will reduce the potential for Decision Error 1. A very conservative approach to delineation may also be utilized where the boundaries of the contaminated media are extended to the first known vertical and horizontal sample locations that reveal concentrations below the desired action level.

7.3 QC Considerations

Laboratory work will follow the requirements specified in the SCQ. If analysis is to be carried out by an off-site laboratory, it will be a Fluor Daniel Fernald approved full service laboratory. Laboratory quality control measures include a media prep blank, a laboratory control sample (LCS), matrix duplicates and matrix spike. Typical Field QC samples are not required for ASL B analysis. However the PSPs may specify appropriate field QC samples for the media type with respect to the ASL in accordance with the SCQ, such as field blanks, trip blanks, and container blanks. All field QC samples will be analyzed at the associated field sample ASL. Data will be validated per project requirements, which must meet the requirements specified in the SCQ. Project-specific validation requirements will be listed in the PSP.

Per the Sitewide Excavation Plan, the following ASL and data validation requirements apply to all **soil and soil field QC samples** collected in association with this DQO:

- If samples are analyzed for Pre-design Investigations and/or Precertification, 100% of the data will be analyzed per ASL B requirements. For each laboratory used for a project, 90% of the data will require only a Certificate of Analysis, the other 10% will require the Certificate of Analysis and all associated QA/QC results, and will be validated to ASL B. Per Appendix H of the SEP, the minimum detection level (MDL) for these analyses will be established at approximately 10% of the action level (the action level for precertification is the

FRL; the action level for pre-design investigations can be several different action levels, including the FRL, the WAC, RCRA levels, ALARA levels, etc.). If this MDL is different from the SCQ-specified MDL, the ASL will default to ASL E, though other analytical requirements will remain as specified for ASL B.

- If samples are analyzed for WAC Attainment and/or RCRA Characteristic Areas Delineation, 100% of the data will be analyzed and reported to ASL B with 10% validated. The ASL B package will include a Certificate of Analysis along with all associated QA/QC results. Total uranium analyses using a higher detection limit than is required for ASL B (10 mg/kg) may be appropriate for WAC attainment purposes since the WAC limit for total uranium is 1,030 mg/kg. In this case, an ASL E designation will apply to the analysis and reporting to be performed under the following conditions:

  - all of the ASL B laboratory QA/QC methods and reporting criteria will apply with the exception of the total uranium detection limit

  - the detection limit will be ≤10% of the WAC limit (e.g., ≤103 mg/kg for total uranium).

- If delineation data are also to be used for certification, the data must meet the data quality objectives specified in the Certification DQO (SL-043).

- Validation will include field validation of field packages for ASL B or ASL D data.

All data will undergo an evaluation by the Project Team, including a comparison for consistency with historical data. Deviations from QC considerations resulting from evaluating inputs to the decision from Section 3, must be justified in the PSP such that the objectives of the decision rule in Section 5 are met.

7.4 Independent Assessment

Independent assessment shall be performed by the FEMP QA organization by conducting surveillances. Surveillances will be planned and documented in accordance with Section 12.3 of the SCQ.

7.5 Data Management

Upon receipt from the laboratory, all results will be entered into the SED as qualified data using standard data entry protocol. The required ASL B, D or E data will undergo analytical validation by the FEMP validation team, as required (see Section 7.3). The Project Manager will be responsible to determine data usability as it pertains to supporting the DQO decision of determining delineation of media

COC's.

7.6 Applicable Procedures

Sample collection will be described in the PSP with a listing of applicable procedures. Typical related plans and procedures are the following:

- Sitewide Excavation Plan (SEP)
- Sitewide CERCLA Quality Assurance Project Plan (SCQ).
- SMPL-01, *Solids Sampling*
- SMPL-02, *Liquids and Sludge Sampling*
- SMPL-21, *Collection of Field Quality Control Samples*
- EQT-06, *Geoprobe® Model 5400 Operation and Maintenance*
- EQT-23, *Operation of High Purity Germanium Detectors*
- EQT-30, *Operation of Radiation Tracking Vehicle Sodium Iodide Detection System*

Data Quality Objectives
Delineating the Extent of Constituents of Concern During Remediation Sampling

1A. Task/Description: Delineating the extent of contamination above the FRLs

1.B. Project Phase: (Put an X in the appropriate selection.)

RI ☐ FS ☐ RD ☒ RA ☐ R,A ☐ OTHER ☐

1.C. DQO No.: SL-048, Rev. 5 DQO Reference No.: ____________

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2. Media Characterization: (Put an X in the appropriate selection.)

Air ☐ Biological ☐ Groundwater ☒ Sediment ☒ Soil ☒

Waste ☒ Wastewater ☐ Surface water ☐ Other (specify) _____

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3. Data Use with Analytical Support Level (A-E): (Put an X in the appropriate Analytical Support Level selection(s) beside each applicable Data Use.)

Site Characterization
A ☐ B ☒ C ☐ D ☒ E ☒

Risk Assessment
A ☐ B ☐ C ☐ D ☐ E ☐

Evaluation of Alternatives
A ☐ B ☐ C ☐ D ☐ E ☐

Engineering Design
A ☐ B ☒ C ☐ D ☒ E ☒

Monitoring during remediation
A ☒ B ☒ C ☐ D ☒ E ☒

Other
A ☐ B ☐ C ☐ D ☐ E ☐

4.A. Drivers: Remedial Action Work Plans, Applicable or Relevant and Appropriate Requirements (ARARs) and the OU2 and/or OU5 Record of Decision (ROD).

4.B. Objective: Delineate the extent of media contaminated with a COC (or COCs) with respect to the action level(s) of interest.

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5. Site Information (Description):

6.A. Data Types with appropriate Analytical Support Level Equipment Selection and SCQ Reference: (Place an "X" to the right of the appropriate box or boxes selecting the type of analysis or analyses required. Then select the type of equipment to perform the analysis if appropriate. Please include a reference to the SCQ Section.)

1. pH [X] *
   Temperature [X] *
   Specific Conductance [X] *
   Dissolved Oxygen [X] *
   Technetium-99 [X] *

2. Uranium [X] *
   Full Radiological [X] *
   Metals [X] *
   Cyanide [ ]
   Silica [ ]

3. BTX [ ]
   TPH [ ]
   Oil/Grease [ ]

4. Cations [ ]
   Anions [ ]
   TOC [ ]
   TCLP [X] *
   CEC [ ]

5. VOA [X] *
   BNA [X] *
   Pesticides [X] *
   PCB [X] *
   COD [ ]

6. Other (specify)

*If constituent is identified for delineation in the individual PSP.

6.B. Equipment Selection and SCQ Reference:

Equipment Selection	Refer to SCQ Section
ASL A ______	SCQ Section: ______
ASL B X	SCQ Section: App. G Tables G-1&G-3
ASL C ______	SCQ Section: ______
ASL D X	SCQ Section: App. G Tables G-1&G-3
ASL E X (See sect. 7.3, pg. 6)	SCQ Section: App. G Tables G-1&G-3

7.A. Sampling Methods: (Put an X in the appropriate selection.)

Biased [X] Composite [ ] Environmental [X] Grab [X] Grid [X]

Intrusive [X] Non-Intrusive [ ] Phased [ ] Source [ ]

DQO Number: SL-048, Rev. 5

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7.B. Sample Work Plan Reference: This DQO is being written prior to the PSPs.

Background samples: OU5 RI

7.C. Sample Collection Reference:

Sample Collection Reference: SMPL-01, SMPL-02, EQT-06

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8. Quality Control Samples: (Place an "X" in the appropriate selection box.)

8.A. Field Quality Control Samples:

Trip Blanks	[X]*	Container Blanks	[X]++
Field Blanks	[X]+	Duplicate Samples	[X]***
Equipment Rinsate Samples	[X]***	Split Samples	[X]**
Preservative Blanks	[ ]	Performance Evaluation Samples	[ ]
Other (specify)			

* For volatile organics only

** Split samples will be collected where required by EPA or OEPA.

*** If specified in PSP.

\+ Collected at the discretion of the Project Manager (if warranted by field conditions)

\+ + One per Area and Phase Area per container type (i.e. stainless steel core liner/plastic core liner/Geoprobe tube).

8.B. Laboratory Quality Control Samples:

Method Blank	[X]	Matrix Duplicate/Replicate	[X]
Matrix Spike	[X]	Surrogate Spikes	[ ]
Tracer Spike	[ ]		

Other (specify) Per SCQ

9. Other: Please provide any other germane information that may impact the data quality or gathering of this particular objective, task or data use.

APPENDIX C

AWWT STOCKPILE OSDF WAC ATTAINMENT SOIL SAMPLE LOCATIONS

TABLE C-1
AWWT STOCKPILE OSDF WAC ATTAINMENT SOIL SAMPLE LOCATIONS

Sample Location	Northing	Easting	Boring Depth (ft)	Sample Depth (ft)[1]	Interval	Alternate Sample Depth (ft)[2]	Interval	Analysis
AWT-001-1	479283.1	1348055.3	4.5	2.5-3.0	6	3.5-4.0	8	TAL A
AWT-001-2	479262.6	1348079.3	13	11-11.5	23	6.0-6.5	13	TAL A
AWT-001-3	479246.1	1348097.3	5	1.0-1.5	3	4.5-5.0	10	TAL A
AWT-001-4	479287.2	1348123.3	1.5	0.0-0.5	1	0.5-1.0	2	TAL A
AWT-001-5	479266.7	1348139.3	9	3.0-3.5	7	6.0-6.5	13	TAL A
AWT-001-6	479281.1	1348177.3	2.5	2.0-2.5	5	0.5-1.0	2	TAL A
AWT-001-7	479246.1	1348205.3	6.5	3.0-3.5	7	5.5-6.0	12	TAL A
AWT-001-8	479266.7	1348231.1	6	2.0-2.5	5	3.0-3.5	7	TAL A
AWT-001-9	479242.0	1348243.3	3	2.5-3.0	6	0.5-1.0	2	TAL A
AWT-001-10	479254.4	1348271.3	2	1.5-2.0	4	1.0-1.5	3	TAL A

[1] The sample depth in feet is calculated for the boring located at the coordinates given in this table. If the boring is moved greater than 3 feet due to accessibility or refusal, a new depth in feet will be calculated based on the same random percentage and the height of the pile at the new location.

[2] The alternate sample depth is used only if the sample cannot be collected at the primary relative depth fraction due to poor sample recovery. If the primary random depth cannot be collected and the alternate random depth is shallower and has already been discarded, the alternate random depth interval will be collected from any additional borings attempted.

TABLE C-2
AWWT STOCKPILE OSDF WAC ATTAINMENT SOIL SAMPLE LOCATIONS

Sample Location	Northing	Easting	Boring Depth (ft)	Sample Depth (ft)[1]	Interval	Alternate Sample Depth (ft)[2]	Interval	Analysis
AWT-001-1	479277.0	1348043.3	2	1.5-2.0	4	0.0-0.5	1	TAL A
AWT-001-2	479246.1	1348079.3	4.5	1.0-1.5	3	0.0-0.5	1	TAL A
AWT-001-3	479244.1	1348097.3	3.5	1.5-2.0	4	3.0-3.5	7	TAL A
AWT-001-4	479252.3	1348127.3	10	3.0-3.5	7	2.0-2.5	5	TAL A
AWT-001-5	479279.0	1348143.3	3.5	0.5-1.0	2	1.0-1.5	3	TAL A
AWT-001-6	479237.9	1348173.3	2.5	1.5-2.0	4	0.5-1.0	2	TAL A
AWT-001-7	479262.6	1348185.3	10	9.5-10.0	20	8.0-8.5	17	TAL A
AWT-001-8	479279.0	1348229.3	2	0.5-1.0	2	1.5-2.0	4	TAL A
AWT-001-9	479262.6	1348245.3	6.5	2.5-3.0	6	4.5-5.0	10	TAL A
AWT-001-10	479248.2	1348265.3	3	2.5-3.0	6	1.5-2.0	4	TAL A

[1] The sample depth in feet is calculated for the boring located at the coordinates given in this table. If the boring is moved greater than 3 feet due to accessibility or refusal, a new depth in feet will be calculated based on the same random percentage and the height of the pile at the new location.

[2] The alternate sample depth is used only if the sample cannot be collected at the primary relative depth fraction due to poor sample recovery. If the primary random depth cannot be collected and the alternate random depth is shallower and has already been discarded, the alternate random depth interval will be collected from any additional borings attempted.

APPENDIX D

TARGET ANALYTE LISTS

APPENDIX D
TARGET ANALYTE LISTS

TAL 20500-PSP-0002-A

Soil Analysis - ICP/MS and GPC		
1	ASL B	Total Uranium
2	ASL B	Technetium-99

TAL 20500-PSP-0002-B

Soil Analysis - ICP/MS		
1	ASL B	Total Uranium